Harmonics Limited

Efficient. Reliable. Revolutionary.

POWER ANALYSIS REPORT

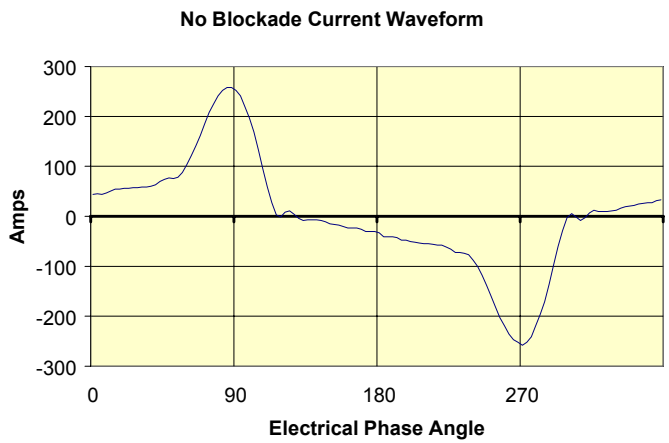
Report:

Date:	**July 2004**
Customer/Location:	**University in California – 150kVA Transformer**
Compiled By:	**Jonathan Piel, Harmonics Limited**
Type Of Loads: (Check all that apply)	☒ **1Ø Personal Computers** ☒ **1Ø Printers** ☒ **1Ø Misc. Office Loads**
Facility:	**Educational Building**
Voltage:	208/120

Data Readings:

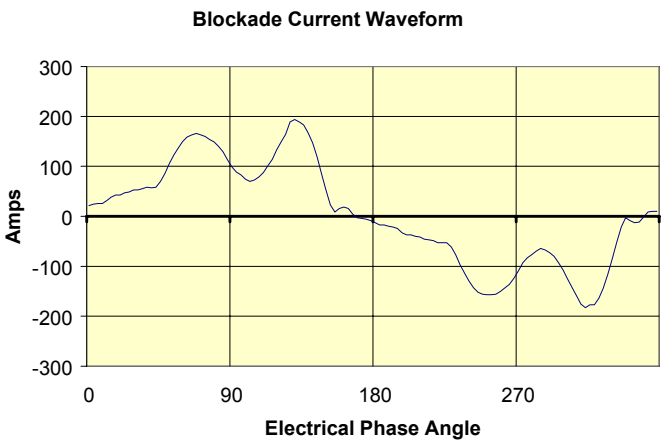
No Blockade:		**Blockade:**	
Date:	**March 2002**	**Date:**	**January 2003**
Instrument:	**PowerSight**	**Instrument:**	**PowerSight**
Measured By:	**Peter Ouellette**	**Measured By:**	**Peter Ouellette**

TRANSFORMER, PHASE A, CURRENT WAVEFORM:



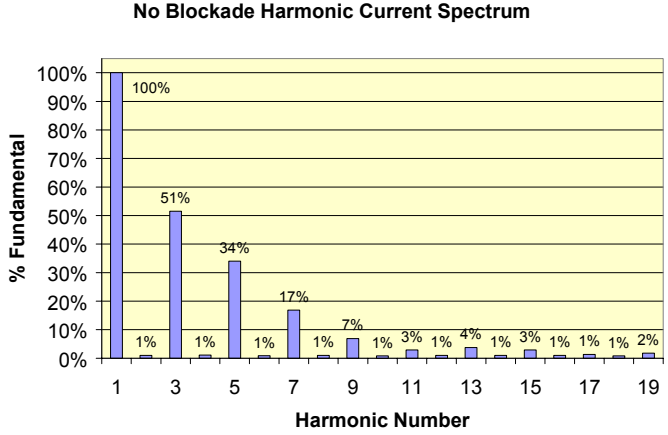
Special Notes During Readings:

TRANSFORMER, PHASE A, CURRENT WAVEFORM:



Special Notes During Readings:

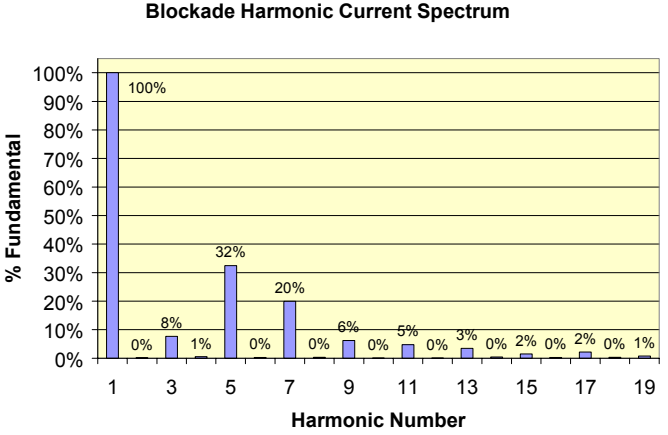
TRANSFORMER, PHASE A, HARMONIC CURRENT SPECTRUM:



Special Notes During Readings:

The 60 Hz Current = 93 amps. The rms current = 110 amps. The rms harmonic current = 60 amps; this is 65% of the fundamental current.

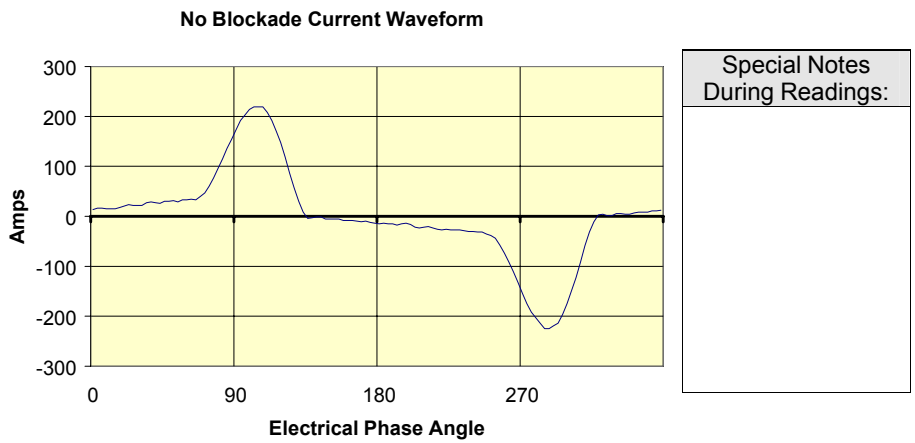
TRANSFORMER, PHASE A, HARMONIC CURRENT SPECTRUM:



Special Notes During Readings:

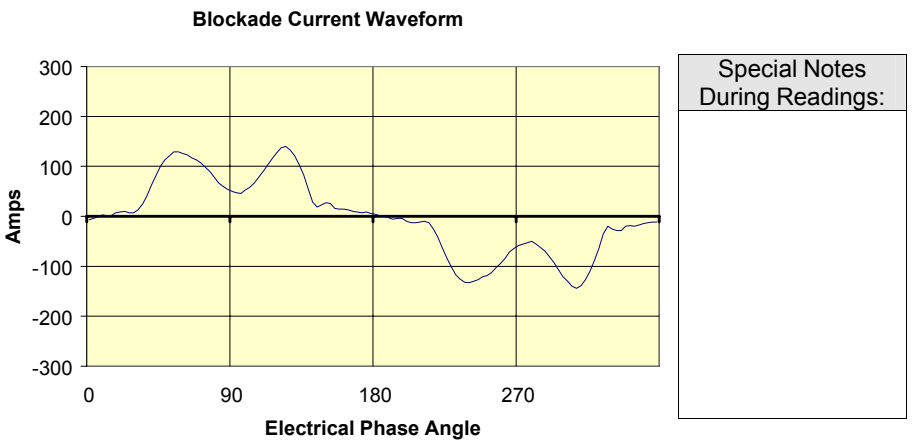
The 60 Hz Current = 94 amps, the loading is almost the same. The rms current = 101 amps, a reduction of 9%. The rms harmonic current = 37 amps; this is 40% of the fundamental current. Use of the Blockade results in a 38% reduction in the percentage of rms harmonic current.

TRANSFORMER, PHASE B, CURRENT WAVEFORM:



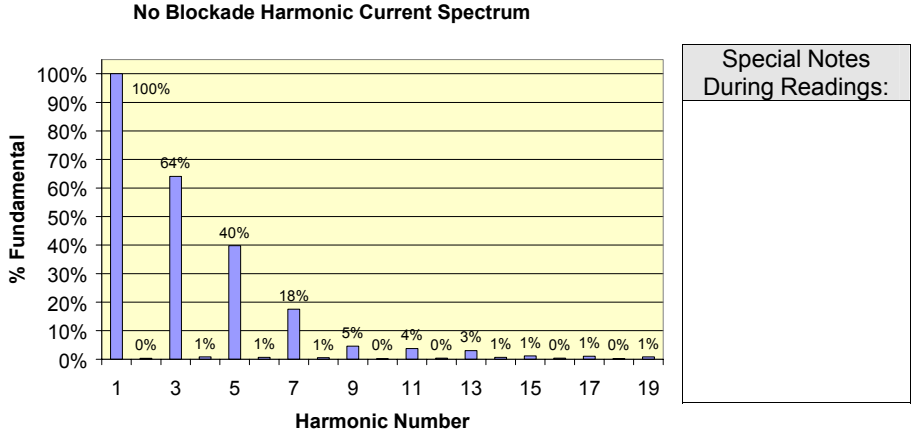
Special Notes During Readings:

TRANSFORMER, PHASE B, CURRENT WAVEFORM:



Special Notes During Readings:

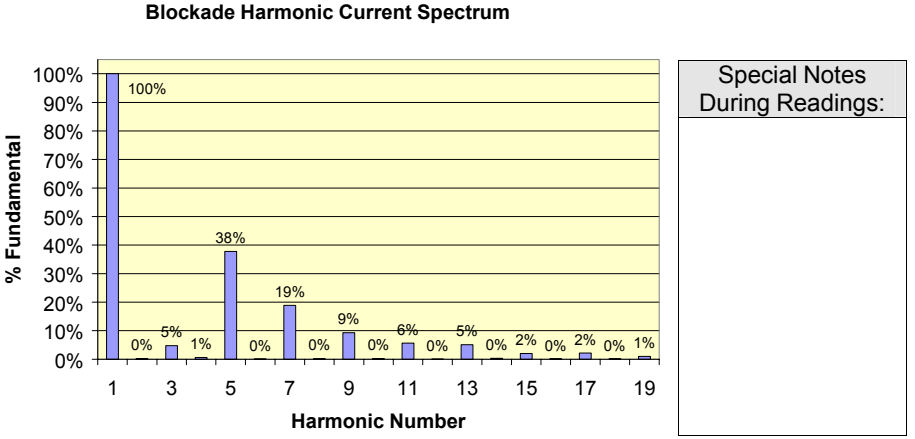
TRANSFORMER, PHASE B, HARMONIC CURRENT SPECTRUM:



Special Notes During Readings:

The 60 Hz Current = 73 amps. The rms current = 92 amps. The rms harmonic current = 57 amps; this is 78% of the fundamental current.

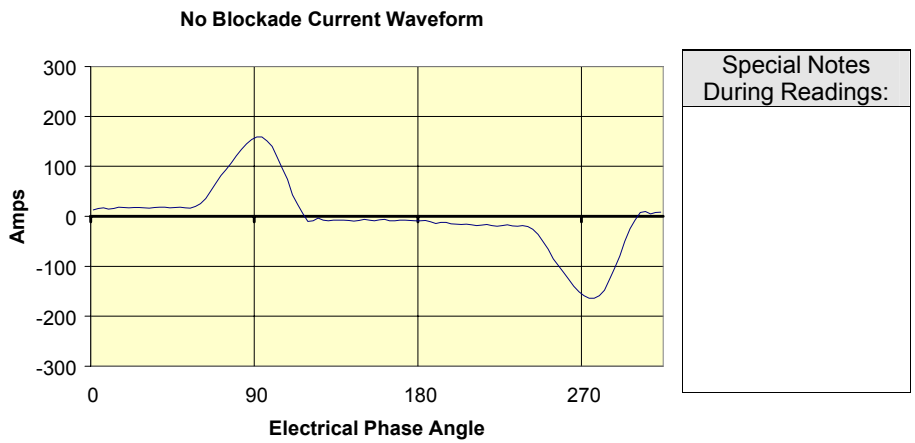
TRANSFORMER, PHASE B, HARMONIC CURRENT SPECTRUM:



Special Notes During Readings:

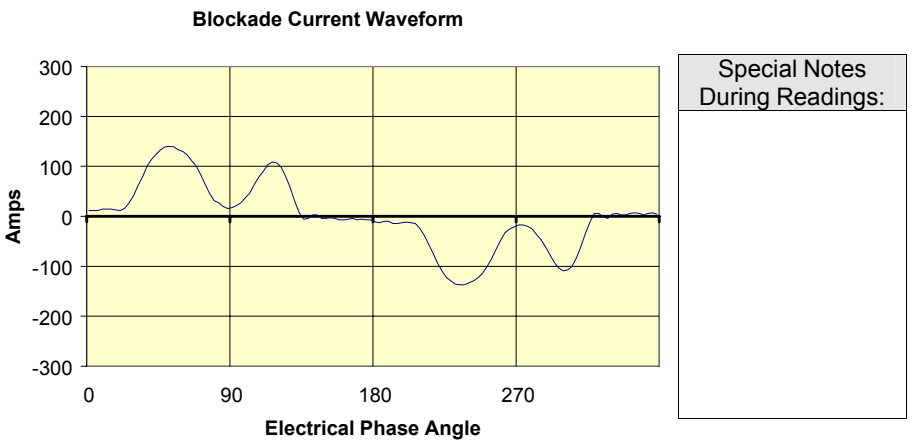
The 60 Hz Current = 69 amps, the loading is almost 5% less. The rms current = 76 amps, a reduction of 18%. The rms harmonic current = 31 amps; this is 44% of the fundamental current. Use of the Blockade results in a 43% reduction in the percentage of rms harmonic current to fundamental current.

TRANSFORMER, PHASE C, CURRENT WAVEFORM:



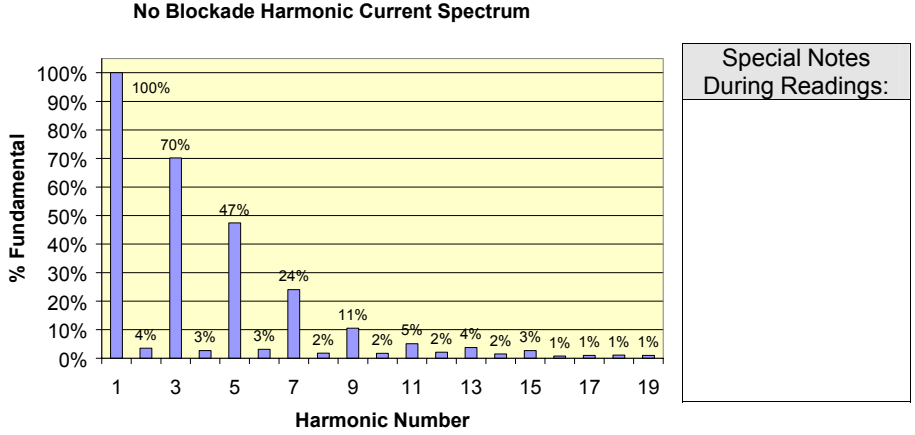
Special Notes During Readings:

TRANSFORMER, PHASE C, CURRENT WAVEFORM:



Special Notes During Readings:

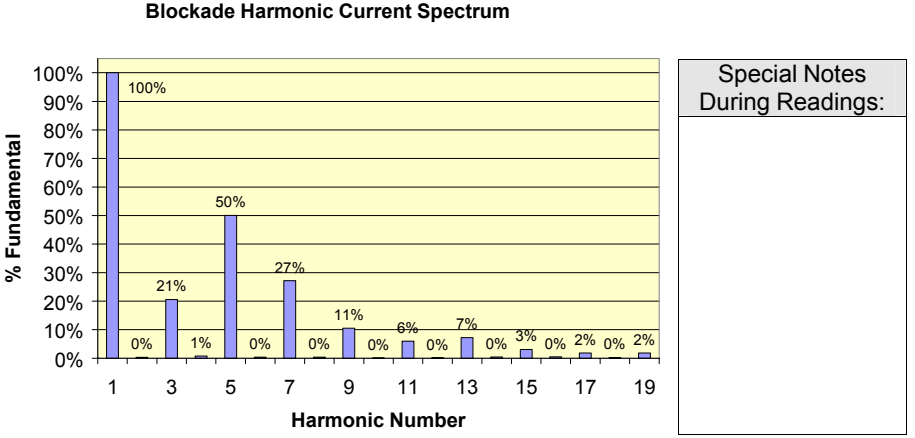
TRANSFORMER, PHASE C, HARMONIC CURRENT SPECTRUM:



Special Notes During Readings:

The 60 Hz Current = 47 amps. The rms current = 63 amps. The rms harmonic current = 42 amps; this is 89% of the fundamental current.

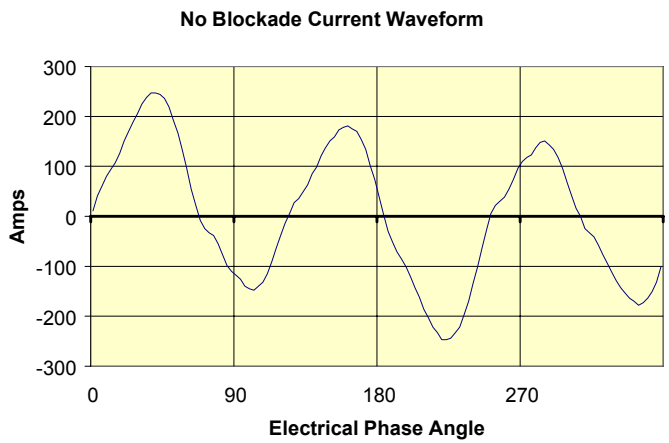
TRANSFORMER, PHASE C, HARMONIC CURRENT SPECTRUM:



Special Notes During Readings:

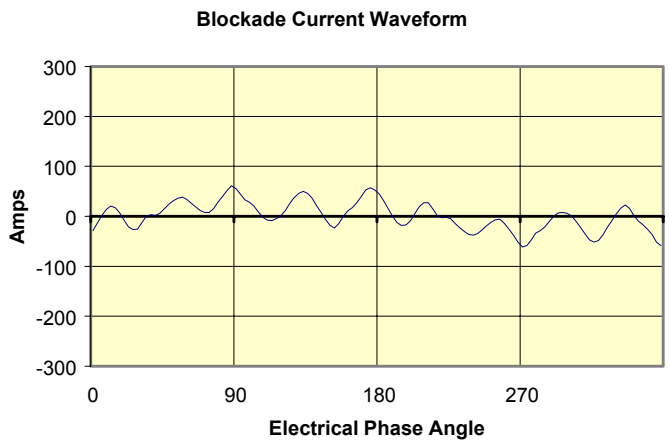
The 60 Hz Current = 57 amps, the loading is almost 20% more. The rms current = 67 amps, an increase of only 6%. The rms harmonic current = 35 amps; this is 62% of the fundamental current. Use of the Blockade results in a 30% reduction in the percentage of rms harmonic current to fundamental current.

TRANSFORMER, NEUTRAL, CURRENT WAVEFORM:



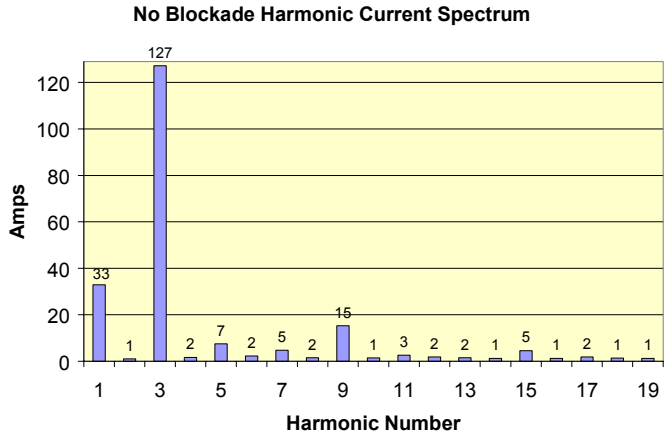
Special Notes During Readings:

TRANSFORMER, NEUTRAL, CURRENT WAVEFORM:



Special Notes During Readings:

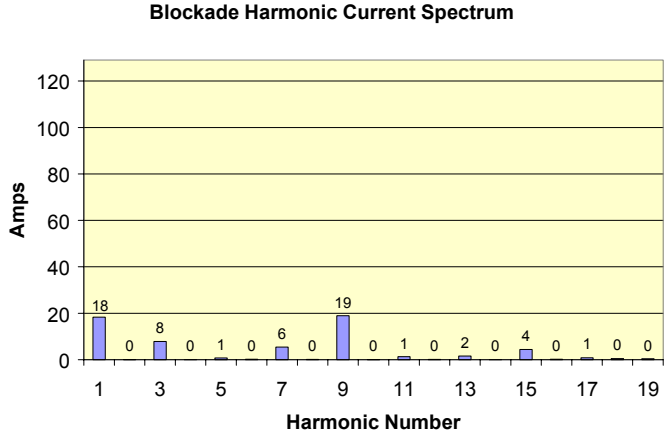
TRANSFORMER, NEUTRAL, HARMONIC CURRENT SPECTRUM:



Special Notes During Readings:

The 60 Hz Current = 33 amps. The rms current = 133 amps. The 3rd harmonic current = 127 amps. The rms harmonic current = 129 amps.

TRANSFORMER, NEUTRAL, HARMONIC CURRENT SPECTRUM:



Special Notes During Readings:

The 60 Hz Current = 18 amps, the fundamental decreased due to better load balance. The rms current = 29 amps. The 3rd harmonic current = 8 amps, this is a 94% reduction in the 3rd harmonic. The rms harmonic current = 22 amps. Use of the Blockade results in a 83% reduction of rms harmonic current.

Summary of Measured Location:

For this 150kVA transformer:

	1a:	1b:	2:	3:	4:
Condition:	**Phases - 3rd Harmonic:**	**Neutral rms vs Phase rms:**	**Avg. Phase Fundamental:**	**Transformer Loading:**	**Load Imbalance:**
No Blockade::	51 – 70%	151%	71 Amps	21%	28%
With Blockade:	5 - 21%	36%	73 Amps	19%	25%
change:	-82%	-64%	+3%	-9%	-11%

1.) The Blockade in this system is functioning perfectly:
   a.) 3rd harmonic is reduced in all phases (see above) and neutral (94%)
      This reduces any wire and transformer heating issues
   b.) The neutral current becomes significantly less than the average phase current
      This eliminates the potential problem that the system would be neutral-capacity limited

2.) Instantaneous data indicates that this facility has increased loads being serviced by 3%.

3.) The combination of load increase and harmonic reduction results in total transformer capacity release of 9%.

4.) The way this loading has been added has resulted in better load balance.

Blockade Performance:

The Harmonics Limited SysteMax product has performed as specified by significantly reducing 3rd harmonic current.

The features include:
- Neutral current reduction
- Phase current reduction

The benefits include:
- Released system capacity
- Reduced wire heating due to harmonic currents
- Reduced transformer heating due to harmonic currents
- Reduced downtime due to heat related problems